

I claim:

1. A particulate material conveying apparatus comprising;
an upper conduit having a material receiving inlet;
a first intermediate conduit communicating with said upper conduit and swivelable relative to said upper conduit about a first axis;
a second intermediate conduit communicating with said first intermediate conduit and swivelable relative to said first intermediate conduit about a second axis parallel to said first axis;
a lower conduit having a material discharge outlet, communicating with said second intermediate conduit and swivelable relative to said second intermediate conduit about a third axis parallel to said second axis; and
means for translating the angular displacement of said second intermediate conduit relative to said first intermediate conduit about said second axis to the angular displacement of said first intermediate conduit relative to said upper conduit about said first axis, upon displacement of said lower conduit along a line of travel thereby maintaining said displacement of said lower conduit along said line of travel.
2. An apparatus according to claim 1 wherein said upper conduit is stationary.
3. An apparatus according to claim 1 wherein said upper conduit is disposed vertically.
4. An assembly according to claim 1 wherein said inlet of said upper conduit is communicable with means holding said particulate material.
5. An apparatus according to claim 1 wherein said lower conduit is displaceable along a line of travel passing through a longitudinal centerline thereof.
6. An apparatus according to claim 5 wherein said line of travel is substantially vertical.

7. An apparatus according to claim 1 wherein said outlet of said lower conduit is communicable with a receptacle.

8. An apparatus according to claim 1 wherein said translating means comprises a member rigidly secured to said upper conduit coaxially with said first axis, a member rigidly secured to said second intermediate conduit coaxially with said second axis and an endless member trained about said members.

9. An apparatus according to claim 1 wherein said translating means comprises a pulley rigidly mounted on said upper conduit coaxially with said first axis, a pulley rigidly mounted on said second intermediate conduit coaxially with said second axis and an endless belt reeved about said pulleys.

10. An apparatus according to claim 1 wherein said translating means comprises a pulley rigidly mounted on said upper conduit coaxially with said first axis, a pulley rigidly mounted on said second intermediate conduit coaxially with said second axis and a cog drive belt reeved about said pulleys.

11. An assembly according to claim 1 wherein said translating means comprises a sprocket rigidly mounted on said upper conduit coaxially with said first axis, a sprocket rigidly mounted on said second intermediate conduit coaxially with said second axis and an endless chain trained about said sprockets.

12. A particulate material conveying apparatus comprising:

an upper segment including an outer impermeable conduit and an inner, permeable conduit spaced from said outer, impermeable conduit to provide an annular plenum therebetween;

a first intermediate segment connected to said upper segment for swivel movement relative thereto about a first axis, including an outer, impermeable conduit and an inner,

permeable conduit spaced from said outer conduit to provide an annular plenum therebetween, said inner, impermeable conduit communicating with said inner, permeable conduit of said upper segment;

a second intermediate segment connected to said first intermediate segment for swivel movement relative thereto about a second axis parallel to said first axis, including an outer impermeable conduit and an inner, permeable conduit providing an annular plenum therebetween, said inner, permeable conduit communicating with said inner permeable conduit of said first intermediate segment;

a lower segment connected to said second intermediate segment for swivel movement relative thereto about a third axis, including an outer impermeable conduit and an inner, permeable conduit spaced from said outer conduit providing an annular plenum therebetween, said inner, permeable conduit communicating with said inner, permeable conduit of said second intermediate segment;

means for translating the angular displacement of said second intermediate segment relative to said first intermediate segment about said second axis to the angular displacement of said first intermediate segment relative to said upper segment about said first axis under displacement of said lower conduit along a line of travel thereby maintaining said displacement of said lower conduit along said line of travel; and

means for supplying air under pressure to at least one of said plenums.

13. An apparatus according to claim 12 wherein said upper segment is stationary.
14. An apparatus according to claim 12 wherein said upper segment is disposed vertically.
15. An apparatus according to claim 12 wherein said upper segment is disposed vertically.

16. An apparatus according to claim 12 wherein said inlet of said inner, permeable conduit of said upper segment is communicable with means holding said particulate material.

17. An apparatus according to claim 12 wherein said lower segment is displaceable along a line of travel passing through the longitudinal centerline thereof.

18. An apparatus according to claim 17 wherein said line of travel is substantially vertical.

19. An apparatus according to claim 12 wherein said outlet of said lower conduit is communicable with a receptacle.

20. An apparatus according to claim 12 wherein said translating means comprises an annular member rigidly secured to said upper segment coaxially with said first axis, an annular member rigidly secured to said second intermediate segment coaxially with said second axis and an endless member trained about said annular members.

21. An apparatus according to claim 12 wherein said translating means comprises a pulley rigidly mounted on said upper segment coaxially with said first axis, a pulley rigidly mounted on said second intermediate conduit coaxially with said second axis and an endless belt reeved about said pulleys.

22. An apparatus according to claim 12 wherein said translating means comprises a pulley rigidly mounted on said upper segment coaxially with said first axis, a pulley rigidly mounted on said second intermediate segment coaxially with said second axis and a cog drive belt reeved about said second pulley.

23. An apparatus according to claim 12 wherein said translating means comprises a sprocket rigidly mounted on said upper segment coaxially with said first axis, a second sprocket rigidly mounted on said second intermediate segment coaxially with said second axis and an endless chain trained about said sprockets.

24. A system for filling a container having an inlet with a bulk particulate material comprising;

means for supporting said container with said inlet thereof opening upwardly;

means elevated relative to said supporting means for holding a supply of said material to be conveyed into said container;

an upper conduit having a material receiving inlet communicable with an outlet of said holding means;

a first intermediate conduit communicating with said upper conduit and swivelable relative to said upper conduit about a first axis;

a second intermediate conduit communicating with said first intermediate conduit and swivelable relative to said first intermediate conduit about a second axis parallel to said first axis;

a lower conduit having an inlet communicating with said second intermediate conduit and a material discharge outlet insertable in the inlet of said container supported on said supporting means, and swivelable relative to said second intermediate conduit about a third axis parallel to said second axis; and

means for translating angular displacement of said second intermediate conduit relative to said first intermediate conduit about said second axis to the angular displacement of said first intermediate conduit relative to said upper conduit about said first axis, upon displacement of said lower conduit along a line of travel thereby maintaining said displacement of said lower conduit along said line of travel.

25. A system according to claim 24 wherein said lower conduit is disposed vertically and said translating means is operable to displace said lower conduit along a vertical line of travel.

26. A system according to claim 24 wherein said lower conduit has a length sufficient to allow a lower end thereof to be inserted through said inlet of said container to a position adjacent a bottom of the interior of said container.

27. A system according to claim 24 including a valve disposed between said holding means and said upper conduit.

28. A system according to claim 24 wherein said holding means comprises a hopper.

29. A system according to claim 28 wherein said hopper is provided with a conically shaped bottom section including means for injecting air under pressure therein allowing said bottom section to fluidize material flowing therethrough.

30. A system according to claim 24 wherein said supporting means comprises a frame structure having a set of depending hangers and said container comprises a bag provided with a set of straps connectable to said hangers for suspending said bag on said structure.

31. A system according to claim 24 including means for weighing said bag.

32. A system according to claim 24 wherein said upper conduit is stationary.

33. A system according to claim 24 wherein upper conduit is disposed vertically.

34. A system according to claim 24 wherein said inlet of said upper conduit is communicable with said holding means.

35. A system according to claim 24 wherein said lower conduit is displaceable along a line of travel passing through the longitudinal centerline thereof.

36. A system according to claim 35 wherein said line of travel is substantially vertical.

37. A system according to claim 24 wherein said outlet of said lower conduit is communicable with the interior of said container.

38. A system according to claim 24 wherein said translating means comprises an annular member rigidly secured to said upper conduit coaxially with said first axis, an annular member rigidly secured to said second intermediate conduit coaxially with said second axis and an endless member trained about said annular members.

39. A system according to claim 24 wherein said translating means comprises a pulley rigidly mounted on said upper conduit coaxially with said first axis, a pulley rigidly mounted on said second intermediate conduit coaxially with said second axis and an endless belt reeved about said pulleys.

40. A system according to claim 24 wherein said translating means comprises a pulley rigidly mounted on said upper conduit coaxially with said first axis, a pulley rigidly mounted on said second intermediate conduit coaxially with said second axis and a cog drive belt reeved about said pulleys.

41. A system according to claim 24 wherein said translating means comprises a sprocket rigidly mounted on said upper conduit coaxially with said first axis, a sprocket rigidly mounted on said second intermediate conduit coaxially with said second axis and an endless chain trained about said sprockets.

42. A system for filling a container having an inlet with a bulk particulate material comprising;

means for supporting said container with said inlet opening upwardly;

means elevated relative to said supporting means for holding a supply of said material to be conveyed into said containers;

an upper segment including an outer, impermeable conduit and an inner, permeable conduit spaced from said outer conduit to provide an annular plenum therebetween, said inner permeable conduit communicating with said holding means;

a first intermediate segment connected to said upper segment for swivelable movement relative thereto about said first axis, including an outer, impermeable conduit and an inner, permeable conduit spaced from said outer conduit to provide an annular plenum there between, said inner, permeable conduit communicating with the inner permeable conduit of said upper segment;

a second intermediate segment connected to said first intermediate segment for swivelable movement relative thereto about a second axis parallel to said first axis, including an outer, impermeable conduit and an inner, permeable conduit spaced from said outer, impermeable conduit to provide an annular plenum therebetween, said inner, permeable conduit communicating with the inner, permeable conduit of said first intermediate segment;

a lower segment connected to said second intermediate segment for swivelable movement relative thereto about a third axis, including an outer, impermeable conduit and an inner, permeable conduit spaced from said outer, impermeable conduit to provide an annular plenum therebetween, and said inner, permeable conduit communicating with the inner, permeable conduit of said second intermediate segment;

means for translating the angular displacement of said second intermediate segment relative to said first intermediate segment about said second axis to the angular displacement of said first intermediate segment relative to said upper segment about said first axis upon displacement of said lower segment along line of travel thereby maintaining said displacement of said lower conduit along said line of travel; and

means for supplying air under pressure to at least one said plenums.

43. A system according to claim 42 wherein said lower segment is disposed vertically and said translating means is operable to displace said lower segment along a vertical line of travel.

44. A system according to claim 42 wherein said lower conduit has a length sufficient to allow a lower end thereof to be inserted through said inlet of said container to a position adjacent a bottom of the interior of said container.

45. A system according to claim 42 including a valve disposed between said holding means and said upper conduit segment.

46. A system according to claim 45 wherein said holding means comprises a hopper.

47. A system according to claim 46 wherein said hopper is provided with a conically-shaped bottom section, and including means for injecting air under pressure along said bottom section to fluidize material flowing therethrough.

48. A system according to claim 42 wherein said upper segment is stationary.

49. A system according to claim 42 wherein said upper segment is disposed vertically.

50. A system according to claim 42 wherein said translating means comprises a member rigidly mounted on said upper segment coaxially with said first axis, a member rigidly mounted on said second intermediate segment coaxially with said second axis and an endless member trained about said annular member.

51. A system according to claim 42 wherein said translating means comprises a pulley rigidly mounted on said upper segment coaxially with said first axis, a pulley rigidly mounted on said second intermediate segment coaxially with said second axis and an endless belt reeved about said pulleys.

52. A system according to claim 42 wherein said translating means comprises a pulley rigidly mounted on said upper segment coaxially with said first axis, a pulley rigidly mounted on said second intermediate segment coaxially with said second axis and a cog drive belt reeved about said pulleys.

53. A system according to claim 42 wherein said translating means comprises a sprocket rigidly mounted on said upper segment coaxially with said first axis, a sprocket rigidly mounted on said second intermediate segment coaxially with said second axis and an endless chain trained about said sprockets.